



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/527,355	03/07/2005	Nobuhiro Nunoya	14321.67	4938
22913	7590	11/19/2007		
WORKMAN NYDEGGER 60 EAST SOUTH TEMPLE 1000 EAGLE GATE TOWER SALT LAKE CITY, UT 84111			EXAMINER STAFFORD, PATRICK	
			ART UNIT 2828	PAPER NUMBER
			MAIL DATE 11/19/2007	DELIVERY MODE PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

**Office Action Summary**

Application No.

10/527,355

Applicant(s)

NUNOYA ET AL.

Examiner

Patrick Stafford

Art Unit

2828

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 29 October 2007.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-10, 12, 14-16 and 50-54 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-10, 12, 14-16 and 50-54 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |   |   |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)  | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date <u>10/29/2007</u> . | 6) <input type="checkbox"/> Other: _____  |

## DETAILED ACTION

### *Claim Rejections - 35 USC § 103*

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claim 1-7, 9-10, 14-16, 50-54 are rejected under 35 U.S.C. 103(a) as being unpatentable over Numai (U.S. Patent 6,501,776, hereafter '776) in view of Funabashi (U.S. Patent 6,580,740, hereafter '740) and further in view of Ikeda et al (U.S. Patent 5,155,737, hereafter '737).

Claim 1: '776 teaches a semiconductor laser comprising:

a gain region having wavelength selectivity (col. 3, lines 24-28, the active layer);

a propagating region optically coupled to said gain region (col. 3, lines 27-28, the light guiding layer), having an effective refractive index whose temperature dependence differs from that of the gain region and having no wavelength selectivity (col. 3, lines 3-15, active layer has the positive refractive-index temperature coefficient, the light guiding layer has the negative refractive-index temperature coefficient); and

a reflecting region that reflects light propagated through the propagating region, and has no gain (col. 4, lines 17-28, the distributed Bragg reflector).

'776 does not explicitly teach the gain region comprising a diffraction grating formed by a periodic perturbation with at least one of real and imaginary parts of a complex refractive index. Funabashi '740 teaches the gain region comprising a diffraction grating formed by a

periodic perturbation with at least one of real and imaginary parts of a complex refractive index is suitable for the grating in a semiconductor laser with an active layer (col. 1, lines 26-41). The selection of something based on its known suitability for its intended use has been held to support a *prima facie* case of obviousness. *Sinclair & Carroll Co. v. Interchemical Corp.*, 325 U.S. 327, 65 USPQ 297 (1945). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the gain region comprising a diffraction grating formed by a periodic perturbation with at least one of real and imaginary parts of a complex refractive index.

'776 and '740 do not explicitly teach the coupling coefficient of the diffraction grating of the gain region being greater than  $300\text{ cm}^{-1}$ . Ikeda '737 teaches a diffraction grating with a very high coupling coefficient, greater than  $300\text{ cm}^{-1}$  as suitable for semiconductor lasers. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use a diffraction grating with a very high coupling coefficient, greater than  $300\text{ cm}^{-1}$ . The subject matter as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made to have selected the overlapping portion of the range disclosed by the reference because overlapping ranges have been held to be a *prima facie* case of obviousness, see *In re Malagari*, 182 U.S.P.Q. 549.

Claim 2: '776 teaches a semiconductor laser comprising:

- a gain region having wavelength selectivity (col. 3, lines 24-28, the active layer);
- a propagating region optically coupled to said gain region (col. 3, lines 27-28, the light guiding layer), having a material with an effective refractive index whose temperature dependence differs from that of the gain region, and having no gain nor wavelength selectivity

(col. 3, lines 3-15, active layer has the positive refractive-index temperature coefficient, the light guiding layer has the negative refractive-index temperature coefficient); and

a reflecting region that reflects light propagated through the propagating region, and has no gain (col. 4, lines 17-28, the distributed Bragg reflector).

'776 does not explicitly teach the propagation region is a material other than a semiconductor. However, it would have been an obvious matter of design choice to use a material other than a semiconductor, since applicant has not disclosed that using a material other than a semiconductor material for a propagating region solves any stated problem or is any particular purpose and it appears that the invention would perform equally well with any material with an effective refractive index whose temperature dependence differs from that of the gain region, and having no gain nor wavelength selectivity.

'776 does not explicitly teach the gain region comprising a diffraction grating formed by a periodic perturbation with at least one of real and imaginary parts of a complex refractive index. Funabashi '740 teaches the gain region comprising a diffraction grating formed by a periodic perturbation with at least one of real and imaginary parts of a complex refractive index is suitable for the grating in a semiconductor laser with an active layer (col. 1, lines 26-41). The selection of something based on its known suitability for its intended use has been held to support a *prima facie* case of obviousness. *Sinclair & Carroll Co. v. Interchemical Corp.*, 325 U.S. 327, 65 USPQ 297 (1945). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the gain region comprising a diffraction grating formed by a periodic perturbation with at least one of real and imaginary parts of a complex refractive index.

'776 and '740 do not explicitly teach the coupling coefficient of the diffraction grating of the gain region being greater than  $300\text{ cm}^{-1}$ . Ikeda '737 teaches a diffraction grating with a very high coupling coefficient, greater than  $300\text{ cm}^{-1}$  as suitable for semiconductor lasers. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use a diffraction grating with a very high coupling coefficient, greater than  $300\text{ cm}^{-1}$ . The subject matter as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made to have selected the overlapping portion of the range disclosed by the reference because overlapping ranges have been held to be a *prima facie* case of obviousness, see *In re Malagari*, 182 U.S.P.Q. 549.

Claim 3: '776 teaches a semiconductor laser comprising:

- a gain region having wavelength selectivity (col. 3, lines 24-28, the active layer);
- a propagating region optically coupled to said gain region (col. 3, lines 27-28, the light guiding layer), having a structure with an effective refractive index whose temperature dependence differs from that of the gain region, and having no gain nor wavelength selectivity (col. 3, lines 3-15, active layer has the positive refractive-index temperature coefficient, the light guiding layer has the negative refractive-index temperature coefficient); and
- a reflecting region that reflects light propagated through the propagating region, and has no gain (col. 4, lines 17-28, the distributed Bragg reflector).

'776 does not explicitly teach the gain region comprising a diffraction grating formed by a periodic perturbation with at least one of real and imaginary parts of a complex refractive index. Funabashi '740 teaches the gain region comprising a diffraction grating formed by a periodic perturbation with at least one of real and imaginary parts of a complex refractive index

is suitable for the grating in a semiconductor laser with an active layer (col. 1, lines 26-41). The selection of something based on its known suitability for its intended use has been held to support a *prima facie* case of obviousness. *Sinclair & Carroll Co. v. Interchemical Corp.*, 325 U.S. 327, 65 USPQ 297 (1945). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the gain region comprising a diffraction grating formed by a periodic perturbation with at least one of real and imaginary parts of a complex refractive index.

'776 and '740 do not explicitly teach the coupling coefficient of the diffraction grating of the gain region being greater than  $300\text{ cm}^{-1}$ . Ikeda '737 teaches a diffraction grating with a very high coupling coefficient, greater than  $300\text{ cm}^{-1}$  as suitable for semiconductor lasers. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use a diffraction grating with a very high coupling coefficient, greater than  $300\text{ cm}^{-1}$ . The subject matter as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made to have selected the overlapping portion of the range disclosed by the reference because overlapping ranges have been held to be a *prima facie* case of obviousness, see *In re Malagari*, 182 U.S.P.Q. 549.

Claim 4: '776, '740 and '737 teach the semiconductor laser as claimed in claim 1. '776 teaches the reflection region has a diffraction grating with a periodic structure (col. 4, lines 17-28, the distributed Bragg reflector). Distributed Bragg reflectors inherently have periodic structures (Furuya U.S. Patent 4,464,762, col. 1, lines 17-23).

Claim 5: '776 teaches a semiconductor laser comprising:

a first gain region having wavelength selectivity (col. 3, lines 24-28, the active layer);

a propagating region optically coupled to said gain region (col. 3, lines 27-28, the light guiding layer), having a material with an effective refractive index whose temperature dependence differs from that of the gain region, and having no gain nor wavelength selectivity (col. 3, lines 3-15, active layer has the positive refractive-index temperature coefficient, the light guiding layer has the negative refractive-index temperature coefficient); and

a second gain region optically coupled to the propagating region, and having wavelength selectively (col. 6, lines 51-58 and col. 19, lines 20-29 and Fig. 12, parts 723).

'776 does not explicitly teach the propagation region is a material other than a semiconductor. However, it would have been an obvious matter of design choice to use a material other than a semiconductor, since applicant has not disclosed that using a material other than a semiconductor material for a propagating region solves any stated problem or is any particular purpose and it appears that the invention would perform equally well with any material with an effective refractive index whose temperature dependence differs from that of the gain region, and having no gain nor wavelength selectivity.

'776 does not explicitly teach the gain region comprising a diffraction grating formed by a periodic perturbation with at least one of real and imaginary parts of a complex refractive index. Funabashi '740 teaches the gain region comprising a diffraction grating formed by a periodic perturbation with at least one of real and imaginary parts of a complex refractive index is suitable for the grating in a semiconductor laser with an active layer (col. 1, lines 26-41). The selection of something based on its known suitability for its intended use has been held to support a *prima facie* case of obviousness. *Sinclair & Carroll Co. v. Interchemical Corp.*, 325 U.S. 327, 65 USPQ 297 (1945). Therefore, it would have been obvious to one of ordinary skill



in the art at the time the invention was made to use the gain region comprising a diffraction grating formed by a periodic perturbation with at least one of real and imaginary parts of a complex refractive index.

'776 and '740 do not explicitly teach the coupling coefficient of the diffraction grating of the gain region being greater than  $300\text{ cm}^{-1}$ . Ikeda '737 teaches a diffraction grating with a very high coupling coefficient, greater than  $300\text{ cm}^{-1}$  as suitable for semiconductor lasers. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use a diffraction grating with a very high coupling coefficient, greater than  $300\text{ cm}^{-1}$ . The subject matter as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made to have selected the overlapping portion of the range disclosed by the reference because overlapping ranges have been held to be a *prima facie* case of obviousness, see *In re Malagari*, 182 U.S.P.Q. 549.

Claim 6: '776 teaches a semiconductor laser comprising:

a first gain region having wavelength selectivity (col. 3, lines 24-28, the active layer);

a propagating region optically coupled to said gain region (col. 3, lines 27-28, the light guiding layer), having a structure with an effective refractive index whose temperature dependence differs from that of the gain region, and having no gain nor wavelength selectivity (col. 3, lines 3-15, active layer has the positive refractive-index temperature coefficient, the light guiding layer has the negative refractive-index temperature coefficient); and

a second gain region optically coupled to the propagating region, and having wavelength selectivity (col. 6, lines 51-58 and col. 19, lines 20-29 and Fig. 12, parts 723).

'776 does not explicitly teach the gain region comprising a diffraction grating formed by a periodic perturbation with at least one of real and imaginary parts of a complex refractive index. Funabashi '740 teaches the gain region comprising a diffraction grating formed by a periodic perturbation with at least one of real and imaginary parts of a complex refractive index is suitable for the grating in a semiconductor laser with an active layer (col. 1, lines 26-41). The selection of something based on its known suitability for its intended use has been held to support a *prima facie* case of obviousness. *Sinclair & Carroll Co. v. Interchemical Corp.*, 325 U.S. 327, 65 USPQ 297 (1945). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the gain region comprising a diffraction grating formed by a periodic perturbation with at least one of real and imaginary parts of a complex refractive index.

'776 and '740 do not explicitly teach the coupling coefficient of the diffraction grating of the gain region being greater than  $300\text{ cm}^{-1}$ . Ikeda '737 teaches a diffraction grating with a very high coupling coefficient, greater than  $300\text{ cm}^{-1}$  as suitable for semiconductor lasers. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use a diffraction grating with a very high coupling coefficient, greater than  $300\text{ cm}^{-1}$ . The subject matter as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made to have selected the overlapping portion of the range disclosed by the reference because overlapping ranges have been held to be a *prima facie* case of obviousness, see *In re Malagari*, 182 U.S.P.Q. 549.

Claim 7: '776, '740 and '737 teach the semiconductor laser of claim 3. '776 teaches the structure of the propagating region differs from a structure of the gain region in at least one of a layer structure (col. 20, lines 19-24).

Claim 9: '776, '740 and '737 teach the semiconductor laser of claim 1. '776 teaches the propagating region is composed of a material whose temperature differential coefficient of the effective refractive index (col. 20, lines 57-63) is different from that of a semiconductor (col. 9, lines 11-18). '776 does not explicitly teach the propagation region is a material other than a semiconductor. However, it would have been an obvious matter of design choice to use a material other than a semiconductor, since applicant has not disclosed that using a material other than a semiconductor material for a propagating region solves any stated problem or is any particular purpose and it appears that the invention would perform equally well with any material with a temperature differential coefficient of the effective refractive index is different from a semiconductor.

Claim 10: '776, '740 and '737 teach the semiconductor laser of claim 1. '776 teaches the propagating region is composed of a material whose temperature differential coefficient of the effective refractive index is negative (col. 3, lines 39-46). '776 does not explicitly teach the propagation region is a material other than a semiconductor. However, it would have been an obvious matter of design choice to use a material other than a semiconductor, since applicant has not disclosed that using a material other than a semiconductor material for a propagating region solves any stated problem or is any particular purpose and it appears that the invention would perform equally well with any material whose temperature differential coefficient of the effective refractive index is negative.

Claim 14: '776, '740 and '737 teach the semiconductor laser of claim 1. '776 teaches the gain region (Fig. 15A, part 1023), the propagating region (Fig. 15A, part 1024), and the reflection region (Fig. 15A, part 1025) are stacked (col. 21, line 66-col. 22, line 15).

Claim 15: '776, '740 and '737 teach the semiconductor laser of claim 1. '776 teaches the gain region and the propagating region are coupled via optical path changing means (col. 7, lines 37-41).

Claim 16: '776, '740 and '737 teach the semiconductor laser of claim 1. '776 teaches the propagating region (Fig. 14A part 924) has a waveguide structure having an optical confinement structure on the upper (Fig. 14A part 921, the cladding layer) and lower portions (col. 21, lines 37-39).

Claims 50-54: Rejected for the same reason as claims 1-6 above.

Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Numai '776 in view of Funabashi '740 and Ikeda et al (U.S. Patent 5,155,737, hereafter '737) and further in view of Kirkby (U.S. Patent 4,583,227, hereafter '227).

'776, '740 and '737 teach the semiconductor laser of claim 1, as discussed above. They do not teach the absolute value of a product of a length of the propagating region and a difference between a temperature differential coefficient of the effective refractive index of the gain region and a temperature differential coefficient of the effective refractive index of the propagating region is equal to or greater than  $7.5 \times 10^{-4} \mu\text{m/K}$ . Kirkby '227 teaches the absolute value of a product of a length of the propagating region and a difference between a temperature differential coefficient of the effective refractive index of the gain region and a temperature

differential coefficient of the effective refractive index of the propagating region is equal to or greater than  $7.5 \times 10^{-4} \mu\text{m/K}$  is a suitable value for temperature compensating semiconductor lasers (col. 7, lines 4-8). The selection of something based on its known suitability for its intended use has been held to support a *prima facie* case of obviousness. *Sinclair & Carroll Co. v. Interchemical Corp.*, 325 U.S. 327, 65 USPQ 297 (1945). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the absolute value of a product of a length of the propagating region and a difference between a temperature differential coefficient of the effective refractive index of the gain region and a temperature differential coefficient of the effective refractive index of the propagating region is equal to or greater than  $7.5 \times 10^{-4} \mu\text{m/K}$ .

Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Numai '776 in view of Funabashi '740 and Ikeda et al (U.S. Patent 5,155,737, hereafter '737) and further in view of Kashyap (U.S. Patent 5,719,974, hereafter '794).

'776, '740 and '737 teach the semiconductor laser of claim 1, as discussed above. They do not explicitly teach the length of the propagating region is determined such that a longitudinal mode spacing determined by a sum of an effective length of the diffraction grating and a length of the propagating region, is greater than a stop bandwidth of the diffraction grating. '794 teaches the length of the propagating region is determined such that a longitudinal mode spacing determined by a sum of an effective length of the diffraction grating and a length of the propagating region, is greater than a stop bandwidth of the diffraction grating (col. 8, line 24 and col. 9, lines 2-5) as suitable values for the diffraction grating in a semiconductor laser. The

selection of something based on its known suitability for its intended use has been held to support a *prima facie* case of obviousness. *Sinclair & Carroll Co. v. Interchemical Corp.*, 325 U.S. 327, 65 USPQ 297 (1945). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to determine the length of the propagating region such that a longitudinal mode spacing determined by a sum of an effective length of the diffraction grating and a length of the propagating region, is greater than a stop bandwidth of the diffraction grating.

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Patrick Stafford whose telephone number is (571) 270-1275. The examiner can normally be reached on M-Th 7:30-5 EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, MinSun Harvey can be reached on (571) 272-1835. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Application/Control Number:  
10/527,355  
Art Unit: 2828

Page 14

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

PJS

PJS

